

# The effect of COVID-19 on children with congenital talipes equinovarus in a tertiary service in the United Kingdom

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During the coronavirus disease 2019 (COVID-19) pandemic, many aspects of healthcare have been hindered. The primary aim of this study was to identify what the impact of COVID-19 was on the delivery of outpatient care for children with congenital talipes equinovarus deformity (CTEV) at a large tertiary hospital in the UK. This study reviewed the patients who commenced their Ponseti treatment between March and September 2020, representing the cohort who received hands-on care during the first wave of the COVID-19 pandemic. Equivalent 6-month periods were searched in 2019 and 2018 as control cohorts. This study included a total of 45 children (72 affected feet) presenting for treatment of clubfoot. Twenty-three babies were seen with CTEV in 2020. For the same time period in 2018 and 2019, 11 babies were treated each year. The distance commuted to by families was higher in 2020 compared to 2019 and 2018, although the difference did not reach statistical significance ( $P=0.301$ ). Treatment with Ponseti casting was commenced at a mean age of 52 days, with no statistically significant differences between cohorts

## Introduction

The ongoing coronavirus disease 2019 (COVID-19) pandemic is one of the most significant and transformative events in the history of modern healthcare [1,2]. Despite the pandemic, children with congenital talipes equinovarus (CTEV) or clubfoot, continue to be born needing time-dependent treatment. During the pandemic, many aspects of healthcare have been prioritised due to the limited resources available leading to the emergence of a new reality for patients with orthopaedic conditions [3–5]. The effects of COVID on children's health and healthcare are substantial, but mainly indirect [6,7]. Widespread efforts are ongoing to protect the provision of children's services. Orthopaedic units around the world have adopted response protocols in line with their peculiar circumstances to cope with the burden of the pandemic [8–11]. The gold standard of CTEV treatment is the Ponseti method [12–14]. During the COVID crisis, many patients were unable to access this care. The primary aim of this study was to identify what the impact of COVID-19 was on the delivery of outpatient care for children with CTEV at an academic tertiary hospital in the UK.

( $P=0.758$ ). Using strict precautions, the Ponseti service at a large tertiary hospital in the UK grew in size and successfully provided treatment for children presenting with CTEV during the first wave of the COVID-19 pandemic. This study has shown that with careful protocols in place, children with CTEV can be treated successfully during times of pandemic, thereby reducing the post-pandemic burden of older children requiring treatment. *J Pediatr Orthop B* 31: e101–e104 Copyright © 2021 Wolters Kluwer Health, Inc. All rights reserved.

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## Methodology

A retrospective review of the CTEV service at a tertiary hospital was performed. Telemedicine was used for older patients. The Ponseti service continued with orthopaedic surgeons, physiotherapists and plaster technicians. A 'cross-cover' system was arranged at the onset of the pandemic to prepare for staff absence due to self-isolation requirements, potential re-deployment or illness – BOA guidelines were followed [7]. Modifications included an extended clinic list thereby allowing extra time for each child's visit. A second clinic room was allocated to reduce exposure risks. COVID-19 specific checks for families were completed via telephone in advance of visits and also on arrival to the hospital and at the clinic reception. Full personal protective equipment (including face mask, visor, plastic apron and surgical gloves) was used for each patient with standard COVID-19 cleaning protocols after each patient encounter. A revised carer information leaflet was devised which updated carers on the processes in the clinic and how to notify the department should they need to self-isolate.

The electronic health record database was screened for new patients attending the CTEV clinic for Ponseti casting appointments between March 2020 and September 2020. This represented the cohort who received hands-on care during the first wave of the COVID-19 pandemic in the UK. Equivalent 6-month periods were searched in 2018 and 2019 as the control cohorts who received the standard of care under normal circumstances. All data were independently collected by three of the authors (U.I., W.P. and L.W.).

The number of new patients, date of birth, gender, associated syndromes, side affected, age referred to clinic, age at first cast, Pirani score at each visit, rates of tendo Achilles tenotomy, number of casts and age at which boots and bars were applied were recorded for each patient attending the clinic. The home postcode was used to determine distance travelled to the clinic. The outcomes at four time periods were recorded:  $t=1$  (date of first clinic appointment or Ponseti casting);  $t=2$  (date of tenotomy procedure, if performed);  $t=3$  (date of first brace); and  $t=4$  (date of latest follow-up).

The Chi-square test was used to compare baseline characteristics of the two cohorts. One-way analysis of variance was used to test significant differences between core outcome measures at each period.  $P < 0.05$  was considered statistically significant. Regression analysis was performed to determine whether distance travelled had a significant effect on key outcome measures at each of the three six-month periods. Statistical analysis was performed in Microsoft Excel 2000 (version 9).

## Results

This study included 45 children (72 affected feet) presenting over the three 6-month time periods (Table 1). Twenty-three babies were seen with CTEV at Royal London Hospital (RLH) for the 2020 period. For the same time period in 2018 and 2019, 11 babies were treated in each year, thus the cast numbers for 2020 more than doubled from 2018 to 2019. There was no significant difference between the groups for males, bilateral presentations, or associated congenital syndromes ( $P=0.326$ ).

Patients registered for care with our hospital followed one of two routes: primary enrolment at our centre ( $n=32$ ; 71.1%) or following referrals from other care providers in our hub and spoke model ( $n=13$ ; 28.9%). In 2020, the proportion of cases with primary enrolment at the RLH was significantly higher than in previous years ( $P=0.022$ ).

On average, each patient lived 9.69 km from the hospital (SD=10.09 km). The distance commuted to by families was higher in 2020 compared to 2019 and 2018, although the difference did not reach statistical significance ( $P=0.301$ ). This is illustrated in Fig. 1.

Treatment with Ponseti casting was commenced at a mean age of 52 days, with no statistically significant differences between cohorts ( $P=0.758$ ). Initial foot complexity,

**Table 1 Demographics and data at  $t_0$ ,  $t_1$ ,  $t_2$ ,  $t_3$  and  $t_4$**

Mean (SD) or number (percent of total %)	Year cohort			P value
	2020	2019	2018	
$t=0$				
Total cases	23	11	11	
Total affected feet	37	17	18	
Male cases	17 (73.9)	7 (63.6)	11 (100)	0.326
Bilateral cases	14 (60.9)	6 (54.5)	7 (63.6)	0.822
Syndromic association	1 (4.3)	1 (9.1)	3 (27.3)	0.085
Shared care with other site	4 (17.4)*	5 (45.4)	4 (36.4)	0.022*
Commuting distance (km)	11.21 (9.64)	6.63 (6.78)	9.43 (13.05)	0.301
$t=1$				
Initial Pirani score	5.09 (0.91)**	4.70 (1.26)**	3.72 (1.76)**	0.001**
Age at first casting (days)	48 (47)	62 (106)	52 (51)	0.758
$t=2$				
Tenotomy rate	35 (94.6)*	14 (82.4)	11 (61.1)	0.002*
Age at tenotomy (days)	75 (40)	48 (12)	66 (21)	0.056
Pirani before tenotomy	2.06 (0.77)	1.93 (0.64)	2.18 (0.75)	0.698
Casts before tenotomy	5.42 (1.46)**	4.57 (0.65)**	5.81 (0.75)**	0.030**
$t=3$				
Age at bracing (days)	100 (44)	121 (146)	90 (43)	0.531
Pirani before bracing	0.25 (0.49)	0.53 (0.72)	0.41 (0.38)	0.234
Casts before bracing	6.70 (2.33)**	5.00 (1.27)**	5.43 (2.10)**	0.013**
$t=4$				
Percent followed-up	22 (95.7)	11 (100)	10 (90.9)	0.964

\*P value is calculated by Chi-square test, marked as significant if  $<0.05$ .

\*\*P value is calculated by ANOVA, marked as significant if  $<0.05$ .

ANOVA, analysis of variance.

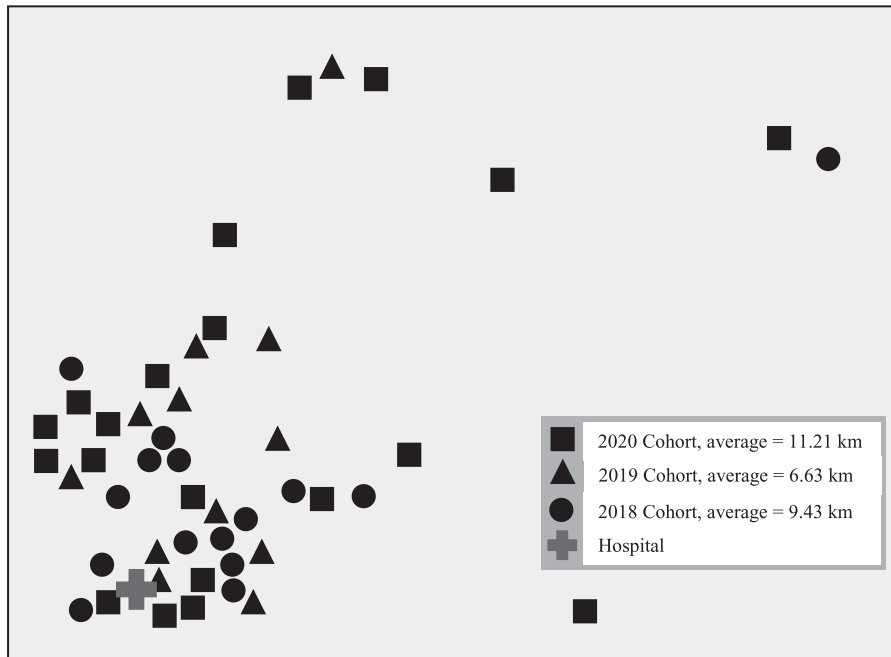
as measured by Pirani scores at the time of application of the first cast, progressively increased in each year studied. This difference reached statistical significance ( $P=0.001$ ).

The rate of tenotomy in 2020 was significantly higher than in previous years ( $P=0.002$ ). The difference in age when tenotomy was performed approached statistical significance, with 2020 having the oldest age on average ( $P=0.056$ ). This could be explained by two older babies referred during the 2020 period with untreated idiopathic clubfoot, who commenced their Ponseti casting treatment at the older ages of 7 and 15 months, respectively.

Despite differences around tenotomy rates, the average age at the start of bracing was similar between all cohorts ( $P=0.531$ ). However, the total number of casts varied significantly between groups, with the highest number of casts used in 2020 ( $P=0.013$ ). This finding also had a significant positive correlation with the average distance commuted ( $R=0.239$ ,  $F=0.050$ ).

Importantly, there were no reported cases of COVID-19 amongst our patients or their carers and none of our patients had to cease their casting treatment once their treatment journey had commenced. Within our team, one of the orthopaedic physiotherapists contracted COVID-19 during this time period and went on sick leave for the duration of the illness and those in close contact were quarantined as per Trust guidelines. This staff member recovered uneventfully and returned to work after full recovery.

Fig. 1



Approximation of patient residences and average distance to the hospital. Visual representation of distance commuted by patients receiving treatment for clubfoot in 2020 (squares ■), 2019 (triangles ▲) and 2018 (circles ●). Each address has been anonymised and plotted with a marker.

## Discussion

During the COVID pandemic, there has been an increasing burden of noncommunicable diseases in all specialties of medicine [1–5]. The aim of the current article was to identify what the impact of COVID-19 had on the management of children with CTEV. From March 2020, the local paediatric orthopaedic service dramatically reduced its output, treating only emergency cases in theatre. Semi-elective services occurred intermittently on a case-by-case basis. The authors decided to prioritise the treatment of our children with clubfoot in an effort to minimise the detrimental effect of COVID-19 on their long-term outcomes. As a result, the number of patients almost doubled compared with previous years, probably best explained by the fact that all surrounding local clinics closed. This CTEV service remained open by adjusting usual practices and implementing a variety of techniques to ensure a safe service was delivered.

The initial treatment of CTEV, if performed early, is relatively simple but the long-term success requires adherence to the foot abduction brace (FAB) protocol [15]. The risk of reduced compliance with the FAB phase of treatment, especially during the COVID-19 period, may jeopardise maintenance of foot correction and indeed increase the likelihood of future surgical management [16–18].

Many hospitals have had to close their services to deal with the pandemic. This has highlighted the nonurgent but time-sensitive nature of paediatric orthopaedics and the ensuing challenges [11,19,20]. Guidelines regarding the

management of clubfoot have been mixed. Ranganamy and colleagues showed that a third of practitioners had stopped seeing children with CTEV altogether [21]. Wong *et al.* showed that they had an increase of over 500% of telehealth outpatient consultations in their paediatric orthopaedic outpatient department [22]. The British Society for Children's Orthopaedic Surgery in conjunction with the United Kingdom Clubfoot Consensus Group provided guidance at the initial stage of the UK lockdown not to start treatment but recognised the unique challenges and varied requirements in different localities [23].

Risk mitigation has included conscientious use of barrier sheeting, personal protective equipment, telemedicine follow-up clinics, and limiting services [9,19]. We followed the BOA guidelines during the COVID-19 pandemic with specific operating procedures for outpatient management [7]. Continuing our Ponseti services has reduced the challenges of treating delayed CTEV which will further reduce pressure on an already pressurised system.

A limitation of this study was the lack of a parent perspective that could provide valuable insight into their experience of treatment during this time.

In conclusion, this study has shown that with careful protocols in place, children with CTEV can be treated successfully during times of pandemic, thereby reducing the post-pandemic burden of older children requiring more complex treatment.

## Acknowledgements

### Conflicts of interest

There are no conflicts of interest.

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